Objectives- By the end of this chapter I will be able to:
1. Identify the subdivisions of the skeleton as axial or appendicular.
2. List at least three functions of the skeletal system.
3. Name the four main classifications of bone.
4. Identify the major anatomical areas of a long bone.
5. Explain the role of bone salts and the organic matrix in making bone both hard and flexible.
6. Describe briefly the process of bone formation in the fetus, and summarize the events of bone remodeling throughout life.
7. Name and describe the various types of fractures.
8. Identify and name the bones of the skull.
9. Describe how the skull of a newborn infant (or fetus) differs from that of an adult, and explain the function of fontanels.
10. Name the parts of a typical vertebra, and explain in general how the cervical, thoracic, and lumbar vertebrae differ from one another.
11. Discuss the importance of the intervertebral discs and spinal curvatures.
12. Explain how the abnormal spinal curvatures (scoliosis, lordosis, and kyphosis) differ from another.
13. Identify the bones of the shoulder and pelvic girdles and their attached limbs.
14. Describe important differences between a male and female pelvis.
15. Name the three major categories of joints, and compare the amount of movement allowed by each.
16. Identify some of the causes of bone and joint problems throughout life.

Objectives continued- Answer each of the objectives on a separate sheet of paper to demonstrate content mastery. Attach answers to back of packet.

Notes Outline
I. Skeletal system
II. Classification of bone on basis of shape
III. Anatomy of lone bone
IV. Bone markings
V. Microscopic anatomy of bone
VI. Formation of human skeleton
VII. Axial skeleton
VIII. Appendicular skeleton
IX. Joints
X. Developmental aspects of skeletal system
1. Classify each of the following terms as a projection (P) or a depression or opening (D). Enter the appropriate letter in the answer blanks.

<table>
<thead>
<tr>
<th>Term</th>
<th>Letter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condyle</td>
<td></td>
</tr>
<tr>
<td>Crest</td>
<td></td>
</tr>
<tr>
<td>Fissure</td>
<td></td>
</tr>
<tr>
<td>Head</td>
<td></td>
</tr>
<tr>
<td>Meatus</td>
<td></td>
</tr>
<tr>
<td>Ramus</td>
<td></td>
</tr>
<tr>
<td>Tuberosity</td>
<td></td>
</tr>
<tr>
<td>Foramen</td>
<td></td>
</tr>
<tr>
<td>Spine</td>
<td></td>
</tr>
</tbody>
</table>

2. Group each of the following bones into one of the four major bone categories. L for long, S for short, F for flat, and I for irregular.

<table>
<thead>
<tr>
<th>Bone</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcaneus</td>
<td></td>
</tr>
<tr>
<td>Frontal</td>
<td></td>
</tr>
<tr>
<td>Femur</td>
<td></td>
</tr>
<tr>
<td>Humerus</td>
<td></td>
</tr>
<tr>
<td>Mandible</td>
<td></td>
</tr>
<tr>
<td>Metacarpal</td>
<td></td>
</tr>
<tr>
<td>Radius</td>
<td></td>
</tr>
<tr>
<td>Sternum</td>
<td></td>
</tr>
<tr>
<td>Vertebra</td>
<td></td>
</tr>
</tbody>
</table>

3. Characterize the following statements relating to long bones. Use these terms: Diaphysis, epiphysis, yellow marrow cavity, epiphyseal plate, red marrow.

A. Site of spongy bone in adult _________
B. Site of compact bone in adult _________
C. Site of hematopoiesis in adult _________
D. Scientific name for bone shaft _________
E. Site of fat storage in adult _________
F. Site of longitudinal growth in child _________

4. Complete the following statements using terms provided in key. Atrophy, gravity, osteoclasts, parathyroid hormone, calcitonin, osteoblasts, osteocytes, stress/tension.

A. When blood calcium levels begin to drop below homeostatic levels, _________ is released, causing calcium to be released from bones.
B. Mature bone cells, called _________, maintain bone in a viable state.
C. Disuse such as that caused by paralysis or severe lack of exercise results in muscle and bone _________
D. Immature, or matrix-depositing, bone cells are referred to as _________
E. _________ Causes blood calcium to be deposited in bones as calcium salts.
F. Bone cells that liquefy bone matrix and release calcium to the blood are called _________
G. Our astronauts must do isometric exercises when in space because bones _________ under conditions of weightlessness or lack of _________

5. The following events apply to the endochondral ossification process as it occurs in the primary ossification center. Put these events in their proper order.

<table>
<thead>
<tr>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavity formation occurs within the hyaline cartilage</td>
</tr>
<tr>
<td>Collar of bone is laid down around the hyaline cartilage model just</td>
</tr>
<tr>
<td>beneath the periosteum</td>
</tr>
<tr>
<td>Periosteal bud invades the marrow cavity</td>
</tr>
<tr>
<td>Perichondrium becomes vascularized to a greater degree and becomes a</td>
</tr>
<tr>
<td>periosteum</td>
</tr>
<tr>
<td>Osteoblasts lay down bone around the cartilage spicules in the bone's</td>
</tr>
<tr>
<td>interior</td>
</tr>
<tr>
<td>Osteoclasts remove the cancellous bone from the shaft interior,</td>
</tr>
<tr>
<td>leaving a marrow cavity that then houses fat</td>
</tr>
</tbody>
</table>

6. Each of the following pictures indicates lateral, anterior, and inferior views of the skull. Color code bones and label bone.
7. Using the key choices, identify the bones indicated by the following descriptions. Fill in using letters

<table>
<thead>
<tr>
<th>A. Ethmoid</th>
<th>B. Frontal</th>
<th>C. Hyoid</th>
<th>D. Lacrimals</th>
</tr>
</thead>
<tbody>
<tr>
<td>E. Mandible</td>
<td>F. Maxillae</td>
<td>G. Nasals</td>
<td>H. Occipital</td>
</tr>
<tr>
<td>I. Palatines</td>
<td>J. Parietals</td>
<td>K. Sphenoid</td>
<td>L. Temporals</td>
</tr>
<tr>
<td>M. Vomer</td>
<td>N. Zygomatic</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. ____ Forehead bone
2. ____ Cheekbone
3. ____ Lower jaw
4. ____ Bridge of nose
5. ____ Posterior part of hard palate
6. ____ Much of the lateral and superior cranium
7. ____ Most posterior part of cranium
8. ____ Single, irregular, bat-shaped bone, forming part of the cranial floor
9. ____ Tiny bones, bearing tear ducts
10. ____ Anterior part of hard palate
11. ____ Superior and middle nasal conchae formed from its projections
12. ____ Site of mastoid process
13. ____ Site of sella turcica
14. ____ Site of cribriform plate
15. ____ Site of mental foramen
16. ____ Site of styloid process
17. ____, 18 ____ 19. ____ 20. ____ Four bones containing paranasal sinuses
21. ____ Its condyles articulate with the atlas
22. ____ Foramen magnum contained here
23. ____ Middle ear found here
24. ____ Nasal septum
25. ____ Bears an upward protrusion, the "cock's comb," or crista galli
26. ____ Site of external acoustic meatus
8. Correctly identify the vertebral parts/areas described as follows:

A. Structure that encloses nerve cord___________
B. Weight-bearing part of vertebra ______________
C. Provide(s) levers for muscles to pull against ______________
D. Provide(s) an articulation point for the ribs ____________
E. Openings allowing spinal nerves to pass ______________

9. The following statements provide distinguishing characteristics of the vertebrae identify each structure using these terms: atlas, axis, cervical vertebra, coccyx, lumbar vertebra, sacrum, thoracic vertebra

A. Type of vertebra(e) containing foramina in the transverse processes, through which the vertebral arteries ascend to reach the brain. _______________________
B. Its dens provides a pivot for rotation of the first cervical vertebra ______________
C. Transverse processes have facets for articulation with ribs; spinous process points sharply downward ____________________
D. Composite bone; articulates with the hip bone laterally ____________________
E. Tailbone; vestigial fused vertebra __________
F. Supports the head; allows the rocking motion of the occipital condyles ________
G. Seven components; unfused ________
H. Twelve components; unfused ________

10. The pictures below show superior views of four types of vertebrae. In spaces provided below indicate which region of the spinal column it would be found, identify also vertebral body, spinous and transverse process, superior articular processes, and vertebral foramen.
11. The figure below is a lateral view of the vertebral column. Identify each number region of the column by listing in the numbered answer blanks the region name first and then the specific vertebrae involved example: sacral region, S#, S#

12. The figure below is an anterior view of the thoracic cage. Select different colors to identify the structures below and color the coding circles and corresponding structures. Label subdivisions of sternum indicated by leader lines
   - All true ribs
   - Costal cartilages
   - All false ribs
   - Sternum

13. Identify the bones below by labeling the three different bones. Using the following terms, complete the illustration by labeling all bone markings provided with leader lines. (Trochlear notch, trochlea, radial tuberosity, capitulum, deltoid tuberosity, head (three), styloid process, coronoid process, olecranon process, greater tubercle, lesser tubercle)
14. Identify bone names or markings according to the descriptions below:

A. Raised area on lateral surface of humerus to which deltoid muscle attaches ________________________

B. Arm bone __________________

C. Bones composing the shoulder girdle ___________ and ________________

D. Forearm bones ____________________

E. Point where scapula and clavical connect __________________

F. Shoulder girdle bone that has no attachment to the axial skeleton __________________

G. Shoulder girdle bone that articulates anteriorly with the sternum ____________

H. Socket in the scapula for the arm bone ________________

I. Process above the glenoid cavity that permits muscle attachment __________________

J. Medial bone of the forearm in anatomical position __________________

K. Rounded knob on the humerus that articulates with the radius __________

L. Anterior depression; superior to the trochlea; receives part of the ulna when the forearm is flexed __________________

M. Forearm bone involved in formation of the elbow joint __________________

N. Bones that articulate with the clavical _____________, and ______________

O. Bones of the wrist ______________

P. Bones of the fingers ______________

Q. Heads of these bones form the knuckles

15. Identify bones and markings indicated by leader lines on the figure. Label the dashed line showing the dimensions of the true pelvis and that showing the diameter of a false pelvis.

16. Identify the bone names and markings according to the descriptions below.

A. Fuse to form the coxal bone (hip bone) __________________

B. Receives the weight of the body when sitting __________________

C. Point where the coxal bones join anteriorly ______________

D. Upper margin of iliac bones ____________________
E. Deep socket in the hip bone that receives the head of the thigh bone
F. Point where the axial skeleton attaches to the pelvic girdle
G. Longest bone in body; articulates with the coxal bone
H. Lateral bone of the leg
I. Medial bone of the leg
J. Bones forming the knee joints
K. Point where the patellar ligament attaches
L. Kneecap
M. Shinbone
N. Distal process on medial tibial surface
O. Process forming the outer ankle
P. Heel bone
Q. Bones of ankle
R. Bones forming the instep of the foot
S. Opening in a coxal bone formed by the pubic and ischial rami

17. Identify each bone, and label the leader lines

18. Identify all bones or groups of bone by writing the correct labels at the end of the leader lines. Color the appendicular and the axial skeleton different colors

19. The following structure of a typical diarthrotic joint. Identify each of the following areas using these terms (articular cartilage of bone ends, fibrous capsule, synovial membrane, joint cavity)
20. For each joint described below, select an answer from Key A. Then if the Key A is other than a synovial joint, further classify using Key B

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Cartilagious</td>
<td>1. Epiphyseal disk</td>
</tr>
<tr>
<td>B. Fibrous</td>
<td>2. Suture</td>
</tr>
<tr>
<td>C. Synovial</td>
<td>3. Symphysis</td>
</tr>
</tbody>
</table>

1. _______ Has amphirarthrotic and synarthrotic examples
2. _______ All have a fibrous capsule line with synovial membrane surrounding a joint cavity
3. _______ Bone regions united by fibrous connective tissue
4. _______ Joints between skull bones
5. _______ Joint between the atlas and axis
6. _______ Hip, elbow, knee
7. _______ All examples are dirarthroses
8. _______ Pubic symphysis
9. _______ All are reinforced by ligaments
10. _______ Joint providing the most protection to underlying structures
11. _______ Often contains a fluid-filled cushion
12. _______ Child’s long bone-growth plate made of hyaline cartilage
13. _______ Most joints and limbs
14. _______ Often associated with bursae
15. _______ Have the greatest mobility

21. Antonio is hit in the face with a football during practice. An X-ray reveals multiple fractures of the bones around an orbit. Name the bones that form margins of the orbit

22. Mrs. Bruso, a woman in her 80’s is brought to the clinic with a fractured hip. X rays reveal compression fractures in her lower vertebral column and extremely low bone density in her vertebrae, hip bones, and femurs. What are the condition, cause and treatments?

23. Jack, a young man, is treated at the clinic for an accident in which he hit his forehead. When he returns for a checkup, he complains that he can’t smell anything. X ray of his head reveals a fracture. Which part of bone was fractured to cause his loss of smell?

24. The serving arm of many tennis players is often significantly larger (thicker) than the other arm. Explain this phenomenon
Define Chapter 5 Vocabulary

1. Axial skeleton
2. Appendicular skeleton
3. Skeletal system
4. Compact bone
5. Spongy bone
6. Long bone
7. Short bone
8. Flat bone
9. Irregular bone
10. Diaphysis
11. Periosteum
12. Perforating
13. Epiphyses
14. Articular cartilage
15. Epiphyseal line
16. Epiphyseal plate
17. Yellow marrow
18. Red marrow
19. Bone markings
20. Osteocytes
21. Lacunae
22. Lamellae
23. Haversian canals
24. osteon
25. Canaliculi
26. Perforating (Volkmann's)
27. Ossification
28. Osteoblasts
29. Osteoclasts
30. Bone remodeling